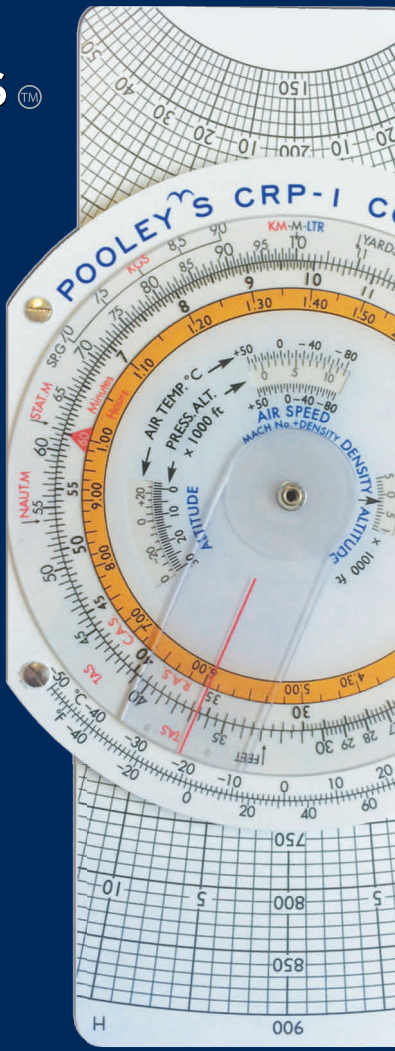
POOLEY'S™

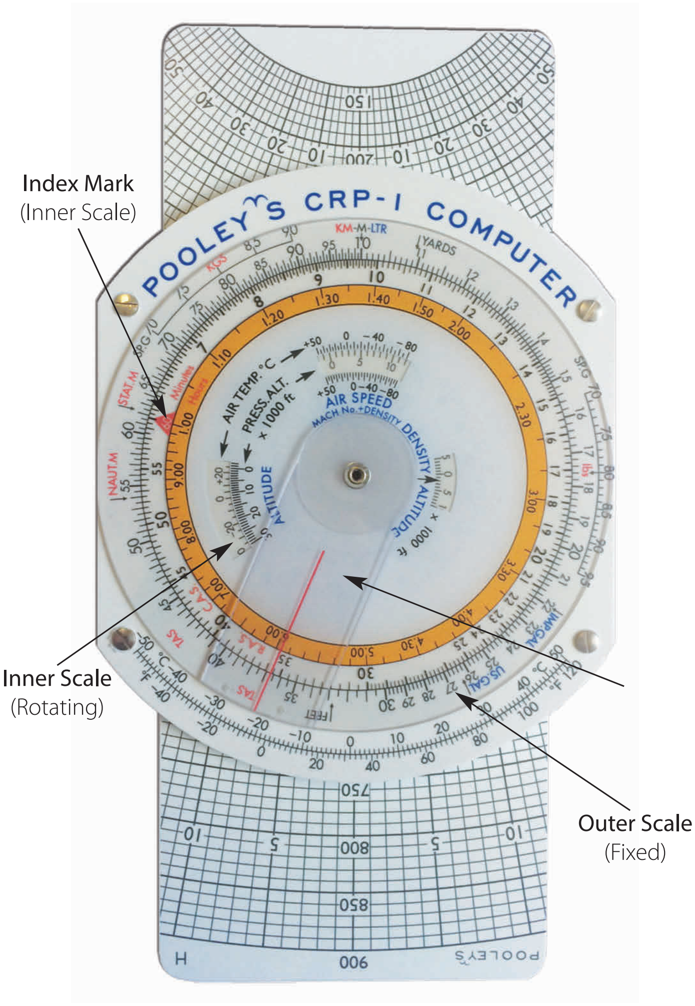
CRP-1

COMPUTER HANDBOOK



for the

CRP-1 & 1W


Index Mark
(Inner Scale)
Inner Scale
(Rotating)
Outer Scale
(Fixed)
POOLEY'S CRP-1 COMPUTER
AIR TEMP. °C
PRESS.ALT. × 1000 ft
AIR SPEED
MACH No.+DENSITY
DENSITY ALTITUDE × 1000 ft
ALTITUDE
KM-M-LTR
YARDS
STAT.M
NAUT.M
Minutes
Hours
C.A.S.
R.A.S.
TAS
IMP.GAL
US.GAL
lbs
KGS
FEET
POOLEY'S

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INTRODUCTION

The Pooleys CRP Computers have been designed to supply a World Aviation Market with the finest Air Navigation Computers that can be made.

The **CRP-1 & 1W Computers** have been designed for **General Aviation** use but, in particular, the CRP-1 computer has been designed as an inexpensive but accurate computer for the student pilot.

The CRP-5 & 5W and 9 Computers are designed for Commercial Aviation Students and Pilots. A separate handbook is available for these computers.

Our computers are made of the best materials available and are guaranteed to withstand temperatures up to 60°C. They are stable, non-inflammable and resistant to mould and moisture. Every care is taken in manufacture to ensure that the resulting product is a high precision instrument both in accuracy and durability.

To maintain clarity and ensure maximum life, do not allow chemicals and particularly solvents to come in contact with the computer ie. nail varnish remover. The computer should not be exposed to extreme of temperature and should be protected from prolonged exposure to sunlight. It is better to mark the computer, when this is necessary, with a pencil as this can be easily erased with a soft rubber. Wiping off chinagraph marks eventually destroys the clarity of the window.

Your computer is guaranteed against defective materials and workmanship and will be replaced free of charge should such faults occur. We trust that your Pooleys Computer will give you satisfactory service.

Robert Pooley

MULTIPLICATION & DIVISION

1. MULTIPLICATION to multiply A by B

Set 1 (shown as 10) on the inner scale against A on the outer scale. Opposite B on the inner scale, read off the answer on the outer scale.

For example: **Multiply 3.5 by 1.8**

Set 1 (10) on the inner scale against 3.5 on the outer scale. Opposite 1.8 on the inner scale, read off the answer 6.3 on the outer scale.

2. DIVISION to divide A by B

Set B on the inner scale against A on the outer scale. Opposite 1 (10) on the inner scale, read off the answer on the outer scale.

For example: **Divide 6.3 by 3.5**

Set 3.5 on the inner scale against 6.3 on the outer. Opposite 1 on the inner scale, read off the answer 1.8 on the outer.

TIME, DISTANCE & SPEED

3. TIME to find the time to cover a distance at a speed

Set the index mark on the inner scale against speed on the outer. Opposite distance on the outer scale, read off the time on the inner.

For example: **Find the time taken to fly 225 nautical miles at 90 knots.**

Set the index mark on the inner scale against the speed 90, on the outer. Opposite 225 on the outer scale read off the answer 150 minutes or 2 hours 30 minutes on the inner. Note that the yellow ring converts minutes to hours.

4. DISTANCE to find distance travelled in a known time at a given speed

Set the index mark on the inner scale against the speed on the outer. Opposite the time on the inner scale, read off the distance on the outer.

For example: **Find the distance travelled in 29 minutes at 87 knots.**

Set the index mark on the inner sale against the speed, 87, on the outer. Against 29 minutes on the inner scale, read off the answer, 42 nautical miles, on the outer.

5. SPEED to find the speed from a known distance covered in a known time

Set the time on the inner against the distance on the outer. Read off the speed on the outer against the index mark on the inner.

For example: **Find the speed in 23 nautical miles are covered in 10 minutes.**

Set 10 minutes on the inner scale against 23 nautical miles on the outer. Read off the speed, 138 knots, against the index mark.

CONVERSIONS OF DISTANCES & SPEEDS

Use the indices which are printed in red on the outer scale.

6. CONVERSIONS between nautical miles, statute miles & kilometres

Set the known quantity on the inner scale against its index on the outer scale. Against the other indices on the outer, read off the answer on the inner scale.

For example: **Convert 66 nautical miles to statue miles and kilometres.**

Set 66 on the inner against the Naut. M. index on the outer. Opposite the Stat. M. index on the outer read off 76 statue miles on the inner. Similarly, opposite the KM-M-LTR index on the outer, read off 122 kilometres on the inner.

7. SPEED CONVERSIONS between knots, mph & kph

Use the same method as in 6.

For example: **Convert 161 kph into both knots and mph.**

Set 161 on the inner against the KM-M-LTR index on the outer. Against the NAUT. M. index on the outer, read off 87 knots on the inner. Against the STAT. M. index on the outer, read off 100 mph on the inner.

8. CONVERSIONS between metres, yards & feet

Proceed as in 6 but using the metres in the KM-M-LTR index and the feet and yards indices.

For example: **Convert 1920 metres to both yards and feet.**

Set 1920 against the KM-M-LTR index on the outer. Opposite the yards index on the outer, read off 2100 on the inner and against the feet index on the outer read off 6300.

WEIGHT CONVERSIONS

9. CONVERSIONS between kilograms & pounds

Proceed as in 6, using the Kgs and Lbs indices.

For example: **Convert 500 lbs to kgs.**

Set 500 on the inner against lbs index on the outer. Against the kgs index read off 227 kgs.

10. CONVERSIONS between imperial gallons, US gallons & litres

Proceed as in 6, using the KM-M-LTR index and the US. GALL and IMP. GALL indices.

For example: **Convert 110 imperial gallons to US gallons and litres.**

Set 110 on the inner against the IMP GALL index on the outer. Against the US GALL index on the outer, read off 132 on the inner. Against the LTR index on the outer, read off 500 on the inner.

11. CONVERSIONS of volume to weight

Use the Specific Gravity scales, Sp.G., but note that there are two scales. One by the Lbs index and one by the Kgs index. Set the volume on the inner against the appropriate index on the outer. Against the given specific gravity read off the weight in either pounds or kilograms on the inner.

For example: **What is the weight in both pounds and kilograms of 110 Imperial gallons at a specific gravity of 0.72?**

Set 110 on the inner against the IMP. GAL index on the outer. Using the Sp.G – Lbs scale, against 0.72, read off 794 Lbs. Using the Sp.G – Kgs scale, against 0.72 read off 360. Judge the 0.72 position as this scale is not as fully graduated as the Sp.G. – Lbs scale.

12. CONVERSIONS of weight to volume

Set the weight on the inner against the specific gravity on the outer using the Sp. G. scale appropriate to either pounds or kilograms. Read off the volume against the appropriate index.

For example: **How many imperial gallons weigh 1000 lbs at a specific gravity of 0.72?**

Set 1000 on the inner scale against 0.72 on the Lbs Sp. G scale. Against the IMP. GAL index, read off 138½ Imperial Gallons.

13. To calculate the fuel required

Set the index mark on the inner scale against the fuel consumption per hour on the outer scale. Against the time on the inner scale, read off the fuel required on the outer scale.

For example: **At a consumption of 12 gallons per hour, how much fuel is required for 80 minutes?**

Set the index mark on the inner scale against 12 on the outer scale. Against 80, or 1 hour 20, read off 16 gallons on the outer scale.

14. To calculate fuel consumption

Set the time on the inner scale against the fuel used on the outer scale. Against the index mark on the inner, read off the fuel consumption on the outer.

For example: **If 52 gallons are used in 130 minutes, what is the fuel consumption?**

Set 130 on the inner scale against 52 on the outer. Against the index mark on the inner scale read of the consumption of 24 gallons per hour on the outer.

15. To calculate endurance

Set the index mark on the inner scale against the consumption on the outer. Opposite the fuel quantity on the outer, read off the endurance on the inner.

For example: **If the fuel consumption is 22 gallons per hour, how long will 55 gallons last?**

Set the index mark on the inner sale against 22 on the outer. Against 55 on the outer, read off 150 minutes on the inner.

CALCULATION OF AIR SPEED

The speed indicated on the Air Speed Indicator is Indicated Air Speed (IAS). When this is corrected for position and instrument error, the result is Rectified Air Speed (RAS). Variation from the International Standard Atmosphere can be compensated for on the computer thus converting RAS to True Air Speed (TAS).

Given the pressure altitude and the outside air temperature, the conversion from RAS to TAS can be made. Pressure altitude is indicated on the altimeter when the sub-scale is set to 1013.2.

The temperature indicated on the outside air thermometer will always be higher than the correct air temperature due to kinetic heating. This rise is a function of speed and the table below gives the value of the rise for various speeds. This value should be subtracted from the indicated outside temperature to give the correct air temperature.

TAS (kts)	**100**	**140**	**175**	**200**	**225**	**245**	**265**	**280**	**300**
Temp. Rise °C	1	2	3	4	5	6	7	8	9

Note: ***That the calculation described in 16 is only valid for a TAS up to 300 kts. Though generally the TAS is higher than the RAS, at low temperatures and low levels the TAS can be less than the RAS.***

16. To calculate TAS (up to 300 kts)

Using the AIR SPEED window, set the temperature against the pressure altitude. Opposite the RAS on the inner scale, read off the TAS on the outer.

For example: **RAS is 150 Kts. Pressure altitude is 18,000 ft. Corrected temperature is -30°C. What is the TAS?**

Using the AIR SPEED window, set -30°C opposite press. Alt 18 (18,000). Opposite the RAS 150 on the inner, read off the TAS, 195, on the outer.

ALTITUDE CALCULATIONS

The altimeter measures:

HEIGHT when the sub-scale is set to QFE.
ALTITUDE when the sub-scale is set to QNH and
PRESSURE ALTITUDE when the sub-scale is set to 1013.2mbs.
PRESSURE ALTITUDE divided by 100 is FLIGHT LEVEL.

Indications of height and altitude are subject to temperature error when the temperature varies from that defined in the International Standard Atmosphere. Pressure Altitude, which is not subject to temperature error, is used on the computer as the basis for calculation.

17. Calculation of true altitude

Using the Altitude window, set the corrected temperature against the pressure altitude. Opposite the indicated altitude on the inner scale, read off the true altitude on the outer.

For example: **The indicated altitude is 17,400 feet. The pressure altitude is 18,000 feet. The corrected temperature is -5°C. What is the true altitude?**

Using the Altitude window, set the temperature, -5°C, against the pressure altitude 18 (18,000). Opposite the indicated 17,400 on the inner scale, read off the true altitude, 18,500 ft.

18. Calculation of density altitude

As aircraft performance figures are quoted in relation to the International Standard Atmosphere (ISA), it may be necessary to convert a pressure altitude to a density altitude. This can be done by using the Air Speed window. Set the temperature against the pressure altitude. The density altitude can be read off in the Density Altitude window.

For example: **Given a pressure altitude of 18,000 ft and a corrected air temperature of -5°C, what is the density altitude?**

Using the Air Speed window, set -5°C against the pressure altitude 18 (18,000). Read off the density altitude of 20,000 ft in the density altitude window.

TEMPERATURE CONVERSION

At the bottom of the fixed outer scale, there is a conversion scale for temperatures between centigrade and fahrenheit.

1 IN 60 RULE CALCULATION

19. TO DISCOVER THE HEADING ERROR

Set the distance flown on the inner scale against the distance off track on the outer. Read off the heading error against the index mark on the inner. This will give the heading correction to avoid any further error. Next set the distance remaining to be flown on the inner scale against the distance off track on the outer. Read off the correction on the outer against the index mark on the inner. Adding the two corrections will give the total correction to arrive at the destination.

For example: **After flying 36 miles of a flight of 81 miles, the aircraft is 3 miles to the right of track. What total correction to heading must be made to arrive at the destination?**

Set 36, distance flown, on the inner scale against 3, distance off track on the outer. Read off the first correction on the outer against the index mark on the inner. This is 5°. Now set the distance to fly, 45 miles, against the distance off track, 3, on the outer.

Read off 4 on the outer against the index mark on the inner. Add the two corrections, 5° and 4°, together to give a total of 9°. Alter heading to 9° to the left.

20. TO DISCOVER DISTANCE OFF TRACK FROM A CO-LOCATED VOR/DME.

The difference between the actual radial and the desired radial is the radial error. Set the index mark on the inner scale against the radial error on the outer. Opposite the DME distance on the inner, read off the distance off track on the outer.

For example: **The actual radial is 248 and the desired radial is 241. The DME range is 43 miles. How far is the aircraft off track?**

Set the index mark on the inner scale against the radial error, 7, on the outer. Opposite the DME range of 43 on the inner, read off thedistance off track, 5, on the outer.

CALCULATION OF THE SPEED OF SOUND

The speed of sound is solely a function of temperature and is referred to as MACH 1.0.

21. USE OF MACH NUMBER INDEX.

The Mach No. Index can be found in the Air Speed window by setting the index mark on the inner scale against 40 on the outer. Using the Air Speed window, set the Mach No. Index against the corrected temperature. Opposite the 1(10) on the inner scale, readoff the speed of sound on the outer.

For example: **What is the speed of sound at a corrected air temperature of -35°C?**

Set the Mach No. Index against -35°C in the Air Speed window. Opposite the 1 on the inner, read off the speed 600 knots on the outer. Having set the scales, conversions of TAS to Mach Number can be made.

For example: **With the scales set as in the above example, convert 330 knots to a Mach No. Against 330 on the outer, read off Mach 0.55. Conversely, Mach 0.8 gives a TAS of 480 knots.**

CRP-1; 1W; THE WIND TRIANGLE COMPUTER

(see inside of back cover)

Where the computer is fitted with a Wind Arm, the method of operation is the same as for computers without a Wind Arm. The fitted Wind Arm saves marking the window with a pencil. The method of operation is described in paragraph 28. Throughout the following paragraphs, reference will be made to the rotating scale which is the one on the rotating window and to the index mark on the fixed part of the computer. This is the black arrow head under True Heading.

The slide is two sided, one gives a low and the other a high speed range. These are marked L and H at the top right hand corners. The slide should be inserted with the appropriate speed range showing through the window. The following examples are based on the low speed range.

22. TO SET THE WIND VELOCITY.

Set the wind direction on the rotating scale against the index mark. By moving the slide, set the centre dot over one of the thicker speed arcs. Since the speed arcs are equidistant, it does not matter which arc. Use a soft pencil to mark a cross on the centre line at a distance representing the wind speed. The mark will either up or down from the centre dot depending on the problem to be solved.

For example: **Set a wind velocity of 230/35.**

Set 230 on the rotating scale against the index mark. Set the centre dot over a speed arc – use the 70. Mark a cross on the centre line over the 105 arc. This would be wind mark UP.

If wind mark DOWN were required, place the cross over the 35 speed arc. In the example problems which follow, it will be clearly stated whether the wind mark goes UP or DOWN.

23. TO FIND HEADING & GROUND SPEED.

Set the wind velocity with the wind mark UP. Set Track on the rotating scale against the index mark. Set TAS under the wind mark. Read off Ground Speed under the centre dot. Read off which drift line the wind mark is over and to which side of the centre line it is. If the wind mark is to the left of the centre line, subtract the value of the drift line from the track to give the Heading, if to the right add it to give the Heading.

For example: **W/V = 330/20. Track = 020. TAS = 90. What is the Heading and Ground Speed?**

Set the wind, 330/20 with the wind mark UP. Set track, 020 against the index mark. Set TAS, 90, under the wind mark. Read off the ground speed which is 76 under the centre dot.

Note that the wind mark is on the 10° drift line to the left of the centre line. Subtract this from the Track 020, to give a Heading of 010.

24. ADDITION OR SUBTRACTION OF DRIFT TO GIVE HEADING.

To either side of the index mark on the fixed part, degrees are marked from 0 to 50. These can be used to convert the Track to Heading. Note the value of the drift line covered by the wind mark and look for this value on the fixed part of the same side of the centre line as the wind mark lies. Read off the Heading on the rotating scale.

For example: **Set Track 085 against the index mark. Assume wind mark is one the 15 drift line to the left of the centre mark. Opposite 15 on the fixed part and to the left of the index mark, read off the Heading 070.**

Opposite 15 on the fixed part and to the left of the index mark, read off the Heading 070.

25. TO FIND WIND VELOCITY.

Set the Track against the index mark. Set Ground Speed under centre dot. Determine whether Heading is to left or right of Track and by how much. If left of Track, wind mark lies to the centre line on the appropriate drift line. If Heading is to the right of Track, the wind mark will be on a drift line to the right of the centre line. Place wind mark over the selected drift line where the speed arc to the value of the TAS intersects it. Rotate the window to place the wind mark on the centre line UP from the centre dot. Read off the wind direction against the index mark and the Wind Speed is the difference between the centre dot and the wind mark.

For example: **Track = 040, Heading = 030, Ground Speed = 74 and TAS = 90. Find the wind velocity?**

Set Track, 040, against the index mark. Set the Ground Speed, 74 under the centre dot. Heading is 030 which is 10° to the left of Track. Wind mark is on the 10° drift line to the left of the centre line. As the TAS is 90, place the wind mark where the 90 speed arc intersects the 10° drift line to the left of the centre line. Rotate the window to place the wind mark above the centre dot and on the centre line. Read off the wind direction 350 against the index mark. Read off the Wind Speed which is 96 – 74, 22 knots.

26. TO FIND TRACK AND GROUND SPEED.

Set the wind but with the wind mark DOWN from the centre dot. Set heading against the index mark. Set the TAS under the centre dot. Read off Ground Speed under the wind mark. Read off the drift to give the resulting Track. If the drift is to the right of the centre line, add the resulting drift to the Heading; if to the left subtract it.

For example: **W/V = 300/20 Heading = 270 TAS = 90**.

Set W/V with the wind mark DOWN 300/20. Set Heading 270 against the index mark. Set TAS 90 under the centre dot. Read off Ground Speed under the wind mark, 72 knots. Drift is 8° left so the resulting Track is 262.

27. TO FIND HEAD & CROSS WIND COMPONENTS.

This problem can be solved using the squared section at the bottom of the low speed slide. The square pattern is symmetrical vertically and horizontally. Set the wind direction against the index mark and the wind speed under the centre dot using the speed arcs on the squared pattern. Mark a cross on the centre line at the zero speed which is at the top of the squared pattern. Set the runway heading against the index mark. This will displace the wind mark so that both components can be read off the scale.

For example: **Surface wind 210/20. Runway 26.**
What are the head and cross wind components?

Set the wind direction 210 against the index mark. Place the centre dot over the Wind Speed, 20. Mark a cross on the zero speed. Set the runway Heading of 260 against the index mark. Read off the head wind component of 14 knots and the cross wind component of 16 knots. The position of the wind mark indicates that the cross wind is coming from the left.

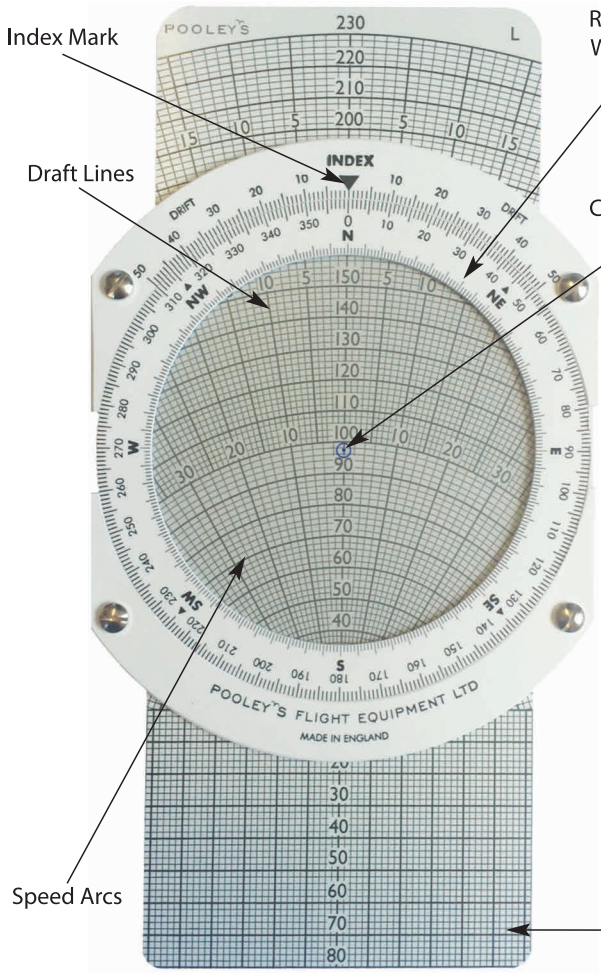
28. USING THE FIXED WIND ARM.

The fixed wind arm is fastened to the centre dot and free to rotate. One half is marked L and the other H. This is to make the speed markings coincide with those on either the low or high speed side of this slide. Its purpose is to avoid having to mark the surface of the window. Set the wind direction using the centre line of the arm. The location of the wind mark will then be below the appropriate speed mark on the wind arm. Where the wind mark is UP, use the top of the L half of the wind arm. If the wind mark is to be DOWN, use the other end.

For example: **W/V = 330/20. Track = 020. TAS = 90.**
Find the heading and ground speed?

Set the top of the L half of the wind arm against 330.
Set the Track of 020 on the rotating scale against the index mark.
Set the TAS of 90 under the 2 (20 kts) on the L half of the arm.
Read off Heading and Ground Speed as in 23.

NOTES


Index Mark
Rotating Window
Draft Lines
Centre Dot
Speed Arcs
Slide
POOLEY'S
INDEX
DRIFT
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